Korean Cave Species of the Superfamily Staphylinoidea (Coleoptera) I

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Abstract We investigated Korean cave species of the superfamily Staphylinoidea from 32 local cave sites and found 21 species belonging to three families. Among them, three species, *Geodromicus hermani* Watanabe, *G. nipponensis* Watanabe and *Bolitobius parasetiger* Schülke belonging to Staphylinidae are newly recorded from Korea and 15 species are newly added in Korean cave-dwelling fauna. Together with one species recorded but not found in this study, a total of 22 species of Staphylinoidea are recorded in Korean cave-dwelling fauna.

Key words cave-dwelling species, check list, Korean fauna

INTRODUCTION

The superfamily Staphylinoidea is one of the very large superfamilies which include seven families, Hydraenidae, Ptiliidae, Agyrtidae, Leiodidae, Scydmaenidae, Silphidae, and Staphylinidae (Ross *et al.*, 2000). Some members of the families, Agyrtidae, Leiodidae, and Staphylinidae show cave-habitat preference.

The Korean cave species in this superfamily were introduced first by Watanabe (1969) who reported *Psephidonus lestevoides* (Sharp, 1889) (= *Geodromicus lestevoides*) and a new species, *Paraleaster coreanus* (= *Derops coreanus*) of Staphylinidae. Szymczakowski (1975) recorded a new genus and a species, *Coreobathyscia solivaga*, of Leiodidae. Lee (1978) and Namkung (1979) published a check list of Korean cave insects only citing the above species. Recently, Smetana (2000) reported a new genus and a species, *Uenohadesina styx*, Staphylinidae from a Korean cave. In total, only four cave-dwelling species of this superfamily have been recorded from Korea so far.

We had an opportunity to investigate Korean cave species of the superfamily which were collected from 32 local cave sites in Korea (Fig. 1 and Table 1) and preserved by Mr. Choi, Yong-Gun (Korean Institute of Biospeleology). We identified 21 species of three families, Agyrtidae, Leiodidae, and Staphylinidae, each with one species, one species and 19 species, respectively. *Coreobathyscia solivaga* Szymczakowski is the only species recorded but could not be found through this study. Among them, three species are newly recorded from Korea and 15 species are newly added in Korean cave-dwelling fauna. As a result, a total of 22

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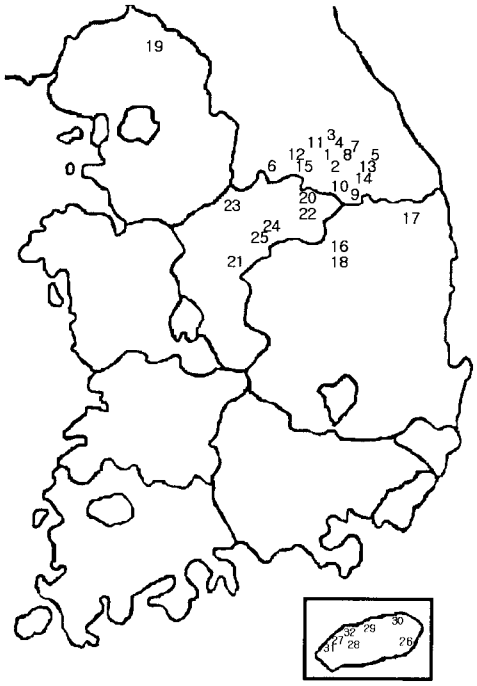


Fig. 1. Distribution of the investigated caves.

species of Staphylinoidea are recorded in korean cave-dwelling fauna.

TAXONOMIC ACCOUNTS

Family Agyrtidae 먼지송장벌레과

1. *Apteroloma potanini* (Semenov, 1893) 먼지송장벌레

Pteroloma potanini Semenov, 1893, Horae Soc. ent. Ross., 27: 338 (Type locality: beim Kloster Dshoni, Tibet)
Apteroloma kozlovi Semenov and Znojko, 1932: 341; Schawaller, 1991: 16.
Garytes coreanus Mroczkowski, 1966: 434 (Korea); Schawaller, 1991: 16.
Apteroloma potanini: Schawaller, 1991: 16; Cho *et al.*, 2001: 219.

Materials examined. 6 exs., coll. site No. 11, 10 VII 1999.
Distribution. Korea, China, Tibet and Russia.

Family Leiodidae 알버섯벌레과

2. *Catops lydiae* Iablokoff-Khnzorian, 1970 황모딱지애송장벌레 (신칭)

Catops lydiae Iablokoff-Khnzorian, 1970, Dokl. Akad. Nauk Armyanskoi SSR, 51: 306 (Type locality: Mt. Chekhova, Sakhalin Is., Russia); Nishikawa and Cho, 2000: 96.
Catops alpinus Szymczakowski, 1976: 21.

Table 1. The local sites and the number of investigated species

Province	Collecting site no.	Local sites investigated	Species
Gangwon-do (15 sites)	1	Byeongchamgul Cave, Buk-myeon, Yeongwol-gun	2
	2	Byeokgolgul Cave, Hadong-myeon, Yeongwol-gun	1
	3	Gaegurigul Cave, Yeongwol-eup, Yeongwol-gun	1
	4	Gossigul Cave, Hadong-myeon, Yeongwol-gun	1
	5	Gyeonggeomsangul Cave, Jeongseon-eup, Jeongseon-gun	2
	6	Hoiokgul Cave, Silim-myeon, Wonju-shi	1
	7	Mureunggul Cave, Suju-myeon, Yeongwol-gun	2
	8	Napjakgul Cave, Hadong-myeon, Yeongwol-gun	1
	9	Sanseonggul Cave, Hadong-myeon, Yeongwol-gun	1
	10	Seokhangsaemmulgul Cave, Jungdong-myeon, Yeongwol-gun	1
	11	Sudalgul Cave (near Donggang River), Yeongwol-eup	2
	12	Sucheongrisujikgul Cave, Mitan-myeon, Pyeongchang-gun	1
	13	Suridonggul Cave, Dong-Myeon, Jeongseon-gun	2
	14	Yujigul Cave, Jeongseon-eup, Jeongseon-gun	1
	15	Yumokjeonggul Cave, Jucheon-myeon, Yeongwol-gun	2
Gyeonsangbuk-do (3 sites)	16	Bugoksutgul Cave, Hogyeo-myeon, Mungyeong-shi	1
	17	Hoitgolgul Cave, Jaesan-myeon, Bonghwa-gun	2
	18	Hwangtigigul Cave, Hogyeo-myeon, Mungyeon-gun	2
Gyeonggi-do (1 site)	19	Cave-8, Hantangang River, Changsu-myeon, Pocheon-gun	2
Chungcheongbuk-do (6 sites)	20	Besilapgul Cave, Danyang-eup, Danyang-gun	1
	21	Cheongseokdarigul Cave, Miwon-myeon Cheongwon-gun	1
	22	Dueumgul Cave, Daegang-myeon, Danyang-gun	1
	23	Gongidonggul Cave, Salmi-myeon, Chungju-si	1
	24	Simbokgul Cave, Yeonpung-myeon, Goisan-gun	1
	25	Suyeogul, Yeonpung-myeon, Goisan-gun	1
Jeju-do (7 sites)	26	Bakjwigul Cave, Namweon-eup, Namjeju-gun	1
	27	Hwanggeumgul Cave, Halim-eup, Bukjeju-gun	1
	28	Jinjidonggul Cave, Mt. Sarabong, Geonip-dong, Jeju-shi	1
	29	Pyeonggul Cave, Odeung-dong, Jeju-shi	1
	30	Sagul Cave, Gujwa-eup, Bukjeju-gun	1
	31	Sinchangseonggul Cave, Hangyeong-myeon, Bukjeju-gun	1
	32	Socheongul Cave, Halim-eup, Bukjeju-gun	1

Materials examined. 4 exs., coll. site No. 14, 5 VII 1999; 3 exs., coll. site No. 26, 18 VIII 1999.

Distribution. Korea and Russia.

3. *Coreobathyscia solivaga* Szymczakowski, 1975 동굴애송장벌레

Coreobathyscia solivaga Szymczakowski, 1975, Annls. Spéléol., 30: 464 (Type locality: Kungkolgul Cave, Korea); Nishikawa and Cho, 2000: 98.

Distribution. Korea.

Remark. This species is known as a Korean endemic cave species that was reported for the first time by Szymczakowski (1975) from Kungkolgul cave (= Gunggolgul), Mungyeong-shi, Gyeongsangbuk-do. Unfortunately, we couldn't find it in the above cave sites.

Family Staphylinidae 반날개과

Subfamily Omaliinae 네눈반날개아과

4. *Geodromicus hermani* (Watanabe, 1991) 큰가슴물가네눈반날개 (신칭) (Figs. 2 & 3)

Psephidonus pusillus Watanabe, 1990, Mem, Tokyo Univ. Agr. 31: 279 (Type locality: Mt. Amagi-san, Honshu, Japan) [preoccupied].
Psephidonus hermani Watanabe, 1991, Elytra 19(1): 43.
Geodromicus hermani: Herman, 2001: 295.

Diagnosis. Body length 5.2-5.8 mm, spindle shaped, black and shining, surface covered with coarse punctures and fine setae. Head about 1.4 times as wide as long (across eyes); with distinct subocular ridge; eye diameter about 1.4 times as long as postocular part; mouth part brown; the distance from eye to apical margin of occelus shorter than the distance of inner margin of each occeli; antennae brown and pubescent; reaching posterior the middle of elytra; the first and the last (11th) antennomeres about 1.5 times as long as 2nd and 10th; 3rd-9th antennomeres about 1.1-1.2 times as long as 2nd and 10th. Pronotum about 1.2 times as wide as head; widest at almost middle; vertical depressed line in middle. Abdomen broad and flat; narrowed toward apical; a pair of pruinoses on 4th tergite. Legs elongate; femur reddish brown; tibiae and tarsi dark reddish brown; male forefemur about 2 times as wide as female's. Male genital organ trilobed; median lobe enlongate; the apical part spade shaped; base piece globular and curved to ventral; parameres narrowed lobes and shorter than median lobe; each parameres with three setae at apical.

Materials examined. 3 exs., coll. site No. 19, 9 V 2001.
Distribution. Korea and Japan.

5. *Geodromicus lestevoides* (Sharp, 1889) 물가네눈반날개

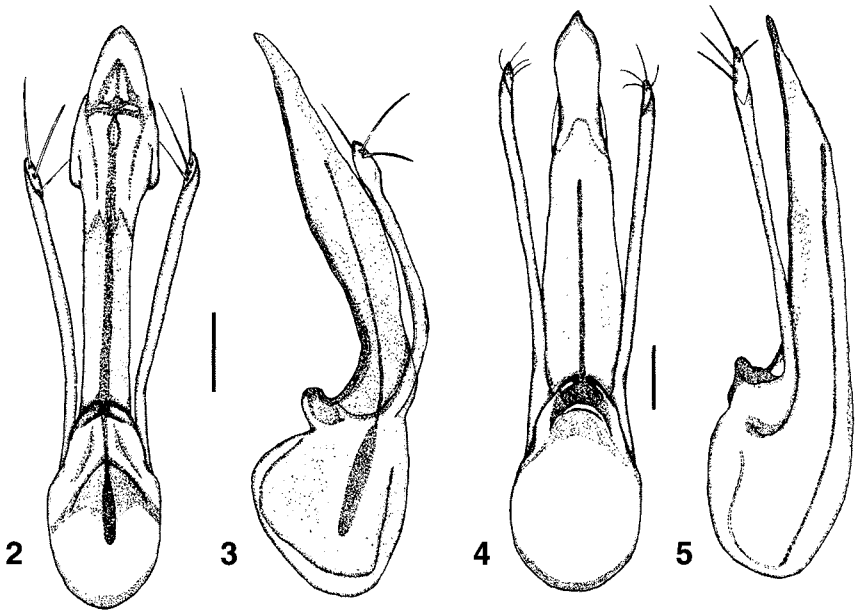
Psephidonus lestevoides Sharp, 1889, Ann. Mag. nat. Hist. (6) III: 470 (Type locality: Hakodate, Japan); Cho and Ahn, 2001: 36.
Geodoromicus lestevoides: Herman, 2001: 297.

Materials examined. 5 exs., coll. site No. 5, 8 V 1999.
Distribution. Korea, Japan and China.

6. *Geodromicus nipponensis* Watanabe, 1990 좀가슴물가네눈반날개 (신칭) (Figs. 4 & 5)

Psephidonus nipponensis Watanabe, 1990, Mem, Tokyo Univ. Agr., 31: 275 (Type locality: Asama Plateau, Honshu, Japan); Cho and Ahn, 2001: 36.
Geodromicus nipponensis: Herman, 2001: 299.

Diagnosis. Body length about 4.7-5.3 mm, spindle shaped, black and shining, surface covered with coarse punctures and fine setae. Head about 1.3 times as wide as long (across eyes); with distinct subocular ridge; eye diameter about 1.8 times as long as postocular part; mouthpart reddish dark brown; the distance from eye to apical margin of occelus shorter than the distance of inner margin of each occeli; antennae reddish dark brown and pubescent; reaching posterior about two fifth of elytra; the first antennomere about 1.5 times as long as 2nd; the last (11th) antennomere about twice as long as 10th; only 10th antennomere 1.4 times as long as wide; the other antennomeres over twice as long as wide; Pronotum about 1.3 times as wide



Figs. 2–5. Male aedeagus: 2 & 3. *Geodromicus hermani* Watanabe; 2. ventral aspect; 3. lateral aspect: 4 & 5. *Geodromicus nipponensis* Watanabe; 4. ventral aspect; 5. lateral aspect. Scale bars = 0.1 mm.

as head; widest at one third; vertical depressed line in middle. Abdomen broad and flat; narrowed toward apical; a pair of pruinoses on 4th tergite. Legs elongate; femur, tibiae and tarsi reddish dark brown. Male genital organ trilobed; median lobe enlongate; narrowed toward apical; base piece globular and curved to ventral; parameres narrowed lobes and shorter than median lobe; each parameres with four setae at apical.

Materials examined. 2 exs., coll. site No. 3, 8 VII 1999; 4 exs., coll. site No. 5, 8 V 1999; 10 exs., coll. site No. 11, 10 VII 1999.

Distribution. Korea and Japan.

7. *Uenohadesina styx* Smetana, 2000 뒷박동굴네눈반날개 (신칭)

Uenohadesina styx Smetana, 2000, Elytra 28(2): 285 (Type locality: Yeongwol-gul Cave, Gangwon-do, Korea).

Materials examined. 4 exs., coll. site No. 4, 30 VII 1966; 1 ex., coll. site No. 12, 8 VII 1999; 1 ex., coll. site No. 17, 2 X 2000.

Distribution. Korea.

Subfamily Paederinae 개미반날개아과

8. *Acanthoglossa hirtella* (Sharp, 1889) 넓적가슴반날개

Eomedon hirtellus Sharp, 1889, Ann. Mag. nat. Hist. (6) III: 320 (Type locality: Nagasaki, Japan).
Achathoglossa hirtella: Cho and Ahn, 2001: 44.

Materials examined. 2 exs., coll. site No. 30, 2 II 1966.

Distribution. Korea and Japan.

9. *Domene crassicornis* (Sharp, 1874) 검은왕개미반날개
Lathrobium crassicorne Sharp, 1874, Tans. ent. London: 59 (Type locality: Maiyasama, Japan).
Domene crassicornis: Cho and Ahn, 2001: 45.

Materials examined. 2 exs., coll. site No. 1, 15 V 2001; 10 exs., coll. site No. 18, 9 IV 2000.
Distribution. Korea, Japan and China.

10. *Homeotarsus japonicum* (Sharp, 1874) 큰긴머리개미반날개
Cryptobium japonicum Sharp, 1874, Tans. ent. London: 60 (Type locality: Japan).
Ochthephilum japonicum: Cho and Ahn, 2001: 47.

Materials examined. 1 ex., coll. site No. 10, 31 VII 1966; 1 ex., coll. site No. 13, 28 III 1985.
Distribution. Korea, Japan and China.

11. *Paederus fuscipes* Curtis, 1823-40 청딱지개미반날개
Paederus fuscipes Curtis, 1823-40: 108 (Type locality: New Forest, Angletere, Europe); Cho and Ahn, 2001: 48.
Paederus idae Sharp, 1874: 75.

Materials examined. 1 ex., coll. site No. 13, 28 III 1985.
Distribution. Cosmopolitan including Korea, Japan and China, except America.

Subfamily Staphylininae 반날개아과

12. *Algon grandicollis* Sharp, 1874 가슴반날개
Algon grandicollis Sharp, 1874, Tans. ent. London: 23 (Type locality: Copper Temple, Nagasaki, Japan); Cho and Ahn, 2001: 65.

Materials examined. 1 ex., coll. site No. 20, 9 X 1971.
Distribution. Korea, Japan and China.

13. *Bisnius parcus* (Sharp, 1874) 작은가슴좀반날개
Philonthus parcus Sharp, 1874, Tans. ent. London: 40 (Type locality: Hiogo, Japan).
Philonthus subaereipennis Bernhauer, 1938: 97.
Bisnius parcus: Schillhammer, 1999: 6; Cho & Ahn, 2001: 65.

Materials examined. 9 exs., coll. site No. 16, 1 X 2000; 1 ex., coll. site No. 29, 13 XI 1999.
Distribution. Korea, Japan and China.

14. *Indoquedius praeditus* (Sharp, 1889) 홍다리왕눈이반날개
Quedius praeditus Sharp, 1889, Ann. Mag. nat. Hist. (6) III: 29 (Type locality: Miyanoshita, Japan); Cho and Ahn, 2001: 83.
Indoquedius praeditus: Herman, 2001: 3080.

Materials examined. 1 ex., coll. site No. 2, 2 V 2001; 1 ex., coll. site No. 1, 15 V 2001; 1 ex., coll. site No. 17, 2 X 2000; 2 exs., coll. site No. 15, 18 IV 2001; 1 ex., coll. site No. 7, 23 IV 1998; 9 exs., coll. site No. 7, 30 IV 2001; 2 exs., coll. site No. 9, 7 II 2001; 1 ex., coll. site No. 22, 19 II 2000; 1 ex., coll. site No. 24, 24 II 1997.

Distribution. Korea, Japan and China.

15. *Othius rufipennis* Sharp, 1874 홍딱지긴반날개

Othius rufipennis Sharp, 1874, Tans. ent. London: 49; Cho and Ahn, 2001: 73 (Type locality: Orakami Marsh, Japan).

Materials examined. 1 ex., coll. site No. 27, 21 V 2000.
Distribution. Korea, Japan and Russia.

16. *Platydracus brevicornis* (Motschulsky, 1862) 홍딱지반날개

Staphylinus brevicornis Motschulsky, 1862, Etudes Entomol., 9 (1860): 11 (Type locality: Japan).
Staphylinus paganus Sharp, 1874: 30
Platydracus brevicornis: Smetana & Davies, 2000: 39; Cho and Ahn, 2001: 81.

Materials examined. 1 ex., coll. site No. 28, 8 V 2000.
Distribution. Korea, Japan and China.

17. *Quedius simulans* Sharp 검은왕눈이반날개

Quedius simulans Sharp, 1874, Tans. ent. London: 25 (Type locality: Japan); Cho and Ahn, 2001: 83

Materials examined. 1 ex., coll. site No. 23, 5 VI 1966; 1 ex., coll. site No. 31, 1 V 1966.
Distribution. Korea, Japan and China.

Subfamily Tachyporinae 뾰족반날개아과

18. *Bolitobius parasetiger* Schülke, 1993 큰가슴뾰족반날개 (신칭) (Figs. 6-9)

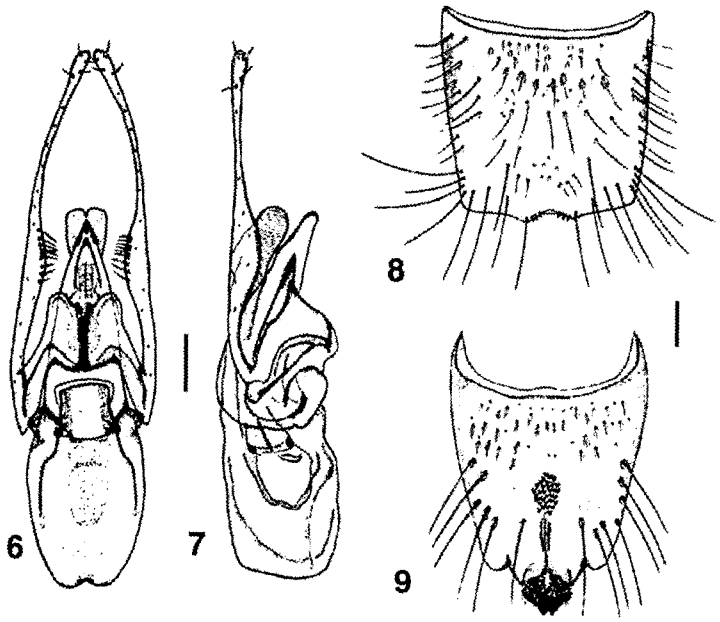
Bolitubius parasetiger Schülke, 1993: 480 (Type locality: Ichiuchi, Japan); Herman, 2001: 695.

Diagnosis. Body length 7.5-8.0 mm, elongate and narrow. Head, pronotum, antennomeres 3rd-10th, and femur dark brown to black; antennomeres 1st, 2nd, 11th, tibiae and tarsus light brown. Elytra bicolored; dark brown with light brown at humeral region and posterior margin. Head about 1.1 times as long as wide; with distinct subocular ridge. Antennomeres 1st-3rd not pubescent, 4th-10th pubescent; antennomeres 11th about 1.4 times as long as 10th. Maxillary palpomere 4th about 1.2 times as long as 3rd. Labial palpomere 3rd elongate, about 2.2 times as long as 2nd. Pronotum about 0.7-0.8 times as long as wide. Elytra about 0.7-0.8 times as long as wide and about 1.5-1.6 times as long as pronotum. Elytra with sutural, five discal, one lateral, and apical rows. Abdomen elongate; sternite VII with 3 pairs short setae at middle emargination, sternite VIII with 3 lobed; inner lobe broad, with heart shape pubescent at apex; with patch of short setae at center. Legs elongate; all tibiae with a few long spur and apex of mesotibiae and metatibiae with uneven spines. Male genital organ large; median lobe much shorter than parameres. Parameres very long and curved inward; many short setae at middle and 3 long setae at middle.

Materials examined. 2 exs., coll. site No. 18, 9 IV 2000.
Distribution. Korea, Japan, China and Russia.

19. *Derops coreanus* (Watanabe, 1969) 굴수염반날개

Paraleaster coreanus Watanabe, 1969, Bull. Nat. Sci. Mus. 12(3): 627 (Type locality: Goyangigul Cave, Gangweon-do, Korea).
Derops coreanus: Smetana, 1983: 277; Cho and Ahn, 2001: 92.



Figs. 6–9. *Bolitobius parasetiger* Schülke: 6. Male aedeagus ventral aspect; 7. Male aedeagus lateral aspect; 8. Male sternite VII; 9. Male sternite VIII. Scale bars = 0.2 mm.

Materials examined. 1 ex., coll. site No. 19, 19 V 2001; 2 exs., coll. site No. 21, 7 VIII 1967; 2 exs., coll. site No. 32, 27 VIII 1972.

Distribution. Korea, Japan and China.

20. *Sepedophilus marshami* (Stephens, 1832) 홀쭉알뾰족반날개

Conurus marshami Stephens, 1832, Mandibulata. 5: 189 (Type locality: Not cited; lectotype designation by Hammond (1973), Britain).

Sepedophilus marshami: Cho and Ahn, 2001: 93.

Materials examined. 2 exs., coll. site No. 7, 30 IV 2001; 1 ex., coll. site No. 8, 1 V 2001; 1 ex., coll. site No 15, 18 IV 2001.

Distribution. Korea, Russia, Europe and America .

21. *Sepedophilus tibialis* (Sharp, 1888) 큰붉은어깨알뾰족반날개

Conosoma tibiale Sharp. 1888, Ann. Mag. Nat. Hist. (6)2: 454 (Type locality: Nikko, Japan).

Sepedophilus tibialis: Cho and Ahn, 2001: 94.

Materials examined. 1 ex., coll. site No. 6, 9 X 2000.

Distribution. Korea and Japan.

22. *Tachinus yezoensis* Li, 1995 큰갈색뾰족반날개

Tachinus yezoensis Li, 1995, I. Jpn. J. Syst. Ent. 1(1): 67 (Type locality: Kamikawa-cho, Hokkaido, Japan); Cho and Ahn, 2001: 95.

Materials examined. 1 ex., coll. site No. 25, 7 V 1967.

Table 2. The cave habitat preferences among the members of Staphylinoidea from Korean cave

Species	Cave habitats		
	Entrance zone	Daylight zone	Inner zone
Family Agyrtidae			
Apteroloma potanini		●	
Family Leiodidae			
Catops lydiae		●	
Coreobathyscia solivaga			●
Family Staphylinidae			
Subfamily Omaliinae			
Geodromicus hermani	●		
Geodromicus lestevoides	●		
Geodromicus nipponensis		●	
Uenohadesina styx			●
Subfamily Paederinae			
Achathoglossa hirtella	●		
Domene crassicornis		●	
Homeotarsus japonicum		●	
Paederus fuscipes		●	
Subfamily Staphylininae			
Algon grandicollis		●	
Bisnius parcus		●	
Indoquedius praeditus		●	
Othius rufipennis		●	
Platydracus brevicornis	●		
Quedius simulans		●	
Subfamily Tachyporinae			
Bolitubius parasetiger		●	
Derops coreanus		●	
Sepedophilus marshami		●	
Sepedophilus tibialis		●	
Tachinus yezoensis	●		
Total 22 species	5	15	2

Distribution. Korea and Japan.

DISCUSSION

The cave habitats are divided into three zones, entrance zone, daylight zone, and inner zone, by the effect of outdoor environment, especially sunlight. The entrance zone is a place where light effects directly, whereas the daylight zone receives daylight indirectly. The inner zone is the constant dark place not reached by the outdoor light. Most of the cave species in this study are living in the daylight zone. Table 2 shows the cave habitat preferences of the investi-gated Staphylinoidea species from Korean caves.

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